What is claimed is:

1. A sample separation apparatus, comprising:

a silicon substrate; and

a first porous silicon region including a matrix and extending a distance across said silicon substrate.

Sub a1

2. The sample separation apparatus of claim 1, wherein said first porous silicon region includes a sample application end contiguous with said porous silicon region.

3. The sample separation apparatus of claim 1, wherein said porous silicon region defines a column.

4. The sample separation apparatus of claim 1, wherein said first porous silicon region extends substantially linearly.

5. The sample separation apparatus of claim 1, comprising a second porous silicon region extending a distance across said silicon substrate.

Sub a2

6. The sample separation apparatus of claim 5, wherein said second porous silicon region defines a control column.

7. The sample separation apparatus of claim 1, further comprising a reactant region positioned along and contiguous with said first porous silicon region.

8. The sample separation apparatus of claim 7, wherein said reactant region comprises a capture component.

9. The sample separation apparatus of claim 7, wherein said reactant region is positioned at a predetermined distance from an end of said first porous silicon region.

10. The sample separation apparatus of claim 5, further comprising a first reaction region disposed along said first porous silicon region and a second reaction region disposed along said second porous silicon region.

11. The sample separation apparatus of claim 10, wherein a distance between said first reaction region and an end of said first porous silicon region is substantially the same as a distance between said second reaction region and an end of said second porous silicon region.

12. The sample separation apparatus of claim 1, further comprising at least one detector disposed proximate said first porous silicon region.

Subt C

13. The sample separation apparatus of claim 12, wherein said at least one detector comprises a thermal detector.

14. The sample separation apparatus of claim 12, wherein said at least one detector comprises a field effect transistor.

15. The sample separation apparatus of claim 12, wherein said at least one detector comprises a voltage application component and a current detection component.

16. The sample separation apparatus of claim 1, further comprising a processor on said silicon substrate.

17. The sample separation apparatus of claim 1, further comprising a memory device on said silicon substrate.

Sub a3

18. The sample separation apparatus of claim 1, further comprising a migration facilitator associated with said first porous silicon region.

19. The sample separation apparatus of claim 18, wherein said migration facilitator comprises a pump operatively associated with a first end of said first porous silicon region.

20. The sample separation apparatus of claim 19, further comprising a control valve disposed between said pump and said first end.

a

21. The sample separation apparatus of claim 18, wherein said migration facilitator comprises a vacuum source operatively associated with a second end of said first porous silicon region.

22. The sample separation apparatus of claim 18, wherein said migration facilitator comprises a first electrode adjacent a first end of said first porous silicon region and a second electrode adjacent a second end of said first porous silicon region.

23. The sample separation apparatus of claim 22, wherein said first electrode is a cathode.

24. The sample separation apparatus of claim 22, wherein said second electrode is an anode.

Subt C9

~~25. The sample separation apparatus of claim 1, further comprising a stationary phase disposed in said matrix.~~

26. The sample separation apparatus of claim 25, wherein said stationary phase comprises a capture substrate.

27. The sample separation apparatus of claim 26, wherein said capture substrate comprises an antibody.

28. The sample separation apparatus of claim 26, wherein said capture substrate comprises an antigen.

29. The sample separation apparatus of claim 1, further comprising a sealing element disposed over at least a portion of said first porous silicon region.

30. A separation apparatus, comprising:

a substrate;

at least one capillary column defined in said substrate and comprising a first porous matrix; and

a detector disposed adjacent said capillary column.

Sub C4

31. The separation apparatus of claim 30, wherein said substrate comprises silicon.

32. The separation apparatus of claim 30, wherein said first porous matrix comprises porous silicon.

Subt C12

33. The separation apparatus of claim 30, wherein said first porous matrix comprises hemispherical grain silicon.

34. The separation apparatus of claim 30, further comprising a solid phase disposed on said first porous matrix.

35. The separation apparatus of claim 34, wherein said solid phase comprises a capture substrate.

36. The separation apparatus of claim 35, wherein said capture substrate comprises an antibody.

37. The separation apparatus of claim 35, wherein said capture substrate comprises an antigen.

38. The separation apparatus of claim 34, wherein said solid phase comprises silicon oxide.

39. The separation apparatus of claim 30, including a pump associated with said at least one capillary column.

40. The separation apparatus of claim 30, further comprising a valve associated with an end of said at least one capillary column.

41. The separation apparatus of claim 30, including a vacuum source associated with said at least one capillary column.

Sub a5

42. The separation apparatus of claim 30, including a first electrode associated with a first end of said first capillary column and a second electrode associated with a second end of said first capillary column.

43. The separation apparatus of claim 30, further comprising a processor associated with said detector.

44. The separation apparatus of claim 30, further comprising a memory device on said substrate.

45. The separation apparatus of claim 30, further comprising at least another capillary column defined in said substrate.

Sub a6

46. The separation apparatus of claim 45, wherein said at least one capillary column and said at least one capillary column each comprise substantially equal lengths.

~~47. The separation~~ apparatus of claim 45, wherein said at least another capillary column comprises a second ~~porous matrix~~.

Subt C15

~~48.~~ The separation apparatus of claim 47, wherein said first porous matrix and said second porous matrix each comprise substantially equal surface areas.

49. The separation apparatus of claim 48, wherein said at least one capillary column and said at least another capillary column each comprise substantially equal volumes.

50. The separation apparatus of claim 30, further comprising a sealing element disposed over at least a portion of said at least one capillary column.

51. A miniature chromatograph, comprising:

a substrate;

a porous matrix defined in a substrate and comprising at least one capillary column; and

sub a7

a plurality of pores defined by said porous matrix.

52. The miniature chromatograph of claim 51, further comprising at least one detector disposed adjacent said at least one capillary column.

53. The miniature chromatograph of claim 52, wherein said at least one detector comprises a thermal detector.

54. The miniature chromatograph of claim 52, wherein said at least one detector comprises a field effect transistor.

55. The miniature chromatograph of claim 52, wherein said at least one detector comprises a voltage application component and a current detection component.

56. The miniature chromatograph of claim 51, further comprising a sealing element disposed over at least a portion of said at least one capillary column.

57. An electrophoretic apparatus, comprising:

Sub a8

a silicon substrate;

at least one sample column in said silicon substrate and comprising a first end, a second end, and a first porous matrix which defines a first plurality of pores; and

a control column comprising a second porous silicon matrix in said silicon substrate which defines a second plurality of pores.

58. The electrophoretic apparatus of claim 57, further comprising:

a first electrode disposed proximate said first end; and

a second electrode disposed proximate said second end.

59. The electrophoretic apparatus of claim 58, wherein said first electrode is a positive electrode.

60. The electrophoretic apparatus of claim 58, wherein said second electrode is a negative electrode.

Subt C21

61. The electrophoretic apparatus of claim 58, wherein said first electrode and said second electrode, when operably connected to a power source, are capable of generating a current along a distance of at least one of said first column and said capillary column.

62. The electrophoretic apparatus of claim 57, wherein said first porous matrix comprises porous silicon.

63. The electrophoretic apparatus of claim 57, wherein said first porous matrix comprises hemispherical grain silicon.

64. An analyte detection apparatus, comprising:
a silicon substrate; and
a porous column defined in said silicon substrate.

sub a9

65. The analyte detection apparatus of claim 64, wherein said porous column comprises a plurality of pores defined through a matrix.

Sub B7

66. The analyte detection apparatus of claim 65, further comprising a capture substrate disposed on said matrix.

67. The analyte detection apparatus of claim 66, wherein said capture substrate comprises an antibody.

68. The analyte detection apparatus of claim 66, wherein said capture substrate comprises an antigen.

69. The analyte detection apparatus of claim 66, further comprising at least one detector proximate said capture substrate.

70. The analyte detection apparatus of claim 69, wherein said at least one detector is a thermal detector, a field effect transistor, or current detector.

Sub C24

~~71. The analyte detection apparatus of claim 64, further comprising a reaction region along the length of said porous column.~~

72. The analyte detection apparatus of claim 64, further comprising a control column on said silicon substrate.

Sub a10

73. The analyte detection apparatus of claim 64, wherein said porous column comprises a matrix of porous silicon.

74. The analyte detection apparatus of claim 64, wherein said porous column comprises a matrix of hemispherical grain silicon.

75. A method of fabricating a separation device, comprising:
providing a silicon substrate;
defining at least one capillary column region on said silicon substrate; and
porifying said capillary column region to define a capillary column including a porous matrix.

76. The method of claim 75, further comprising fabricating at least one detector adjacent said column.

77. The method of claim 75, further comprising applying a stationary phase to said matrix.

78. The method of claim 77, wherein said applying comprises binding a capture substrate to said matrix.

79. The method of claim 78, wherein said capture substrate comprises an antibody.

80. The method of claim 78, wherein said capture substrate comprises an antigen.

81. The method of claim 75, further comprising disposing a sealing element over said capillary column.

82. The method of claim 76, further comprising associating a processor with said detector.

83. The method of claim 82, further comprising forming said processor or said substrate.

84. The method of claim 76, further comprising associating a memory device with the separation device.

85. The method of claim 84, further comprising forming said memory device on said substrate.

86. The method of claim 75, further comprising:
defining at least one reaction region along a length of said at least one capillary column region; and
porifying said reaction region.

87. The method of claim 75, further comprising associating a migration facilitator with said at least one capillary column region.

88. The method of claim 75, further comprising fabricating a first electrode proximate a first end of said at least one capillary column region and a second electrode proximate a second end of said at least one capillary column region.

89. A method of substantially isolating a constituent of a sample, comprising:
dispersing the sample in a mobile phase;
applying the sample to a first end of a porous capillary column comprising a matrix which defines a plurality of pores; and
drawing the sample across a flowfront through said porous capillary column so as to enhance separation of the constituent therefrom.

90. The method of claim 89, further comprising detecting the constituent with at least one detector disposed proximate a detecting region of said porous capillary column.

91. The method of claim 89, further comprising applying a stationary phase to said matrix.

92. The method of claim 89, wherein said dispersing comprises vaporizing the sample in a gaseous mobile phase.

93. The method of claim 92, wherein said gaseous mobile phase is a substantially inert gas.

94. The method of claim 93, wherein said substantially inert gas is nitrogen, hydrogen, helium or argon.

95. The method of claim 89, wherein said dispersing comprises dissolving the sample in a liquid mobile phase.

96. The method of claim 89, wherein said drawing separates the constituent from the sample on the basis of a size of the constituent.

97. The method of claim 89, wherein said drawing separates the constituent from the sample on the basis of an electrical charge of the constituent.

98. The method of claim 89, wherein said drawing separates the constituent from the sample on the basis of an affinity of the constituent for a capture substrate disposed on said matrix.

99. The method of claim 98, wherein said capture substrate is an antibody.

100. The method of claim 98, wherein said capture substrate is an antigen.

101. The method of claim 89, further comprising applying a differential pressure to said porous capillary column to effect said drawing.

102. The method of claim 89, wherein said drawing occurs without applying differential pressure to said porous capillary column.

103. The method of claim 102, wherein said drawing comprises capillary action induced by said matrix.

104. The method of claim 89, wherein said drawing comprises applying an electrical current across the length of said porous capillary column.

105. An ultrasmall flow channel device, comprising:

a flow inlet; and

a flow channel connected to said inlet, said flow channel being formed of hemispherical grained silicon.

106. The ultrasmall flow channel device of claim 105, wherein said flow channel further comprises a stationary phase disposed on said hemispherical grained silicon.

107. The ultrasmall flow channel of claim 106, wherein said stationary phase comprises silicon oxide.

108. A method of making an ultrasmall flow channel device, said method comprising the steps of:

forming an elongate trench in a said substrate assembly; and

forming hemispherical grained silicon in said elongate trench.

109. The method of claim 108, further comprising disposing a stationary phase on said hemispherical grained silicon.

110. The method of claim 109, wherein said stationary phase comprises silicon oxide.